NOAA Climate Test Bed (CTB) Overview

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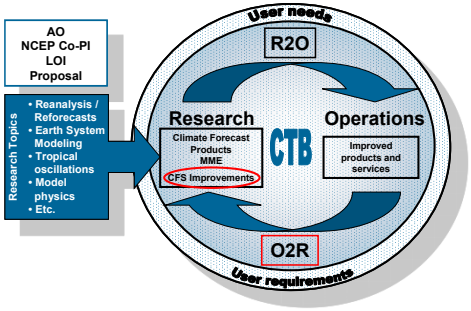
Boulder, CO



Climate Test Bed (CTB) Mission and Priorities

Mission: Advancing Operational Climate Prediction and Products

- Accelerate research-to-operation (**R2O**) transition to improve NCEP operational climate prediction
- Provide operation-to-research (**O2R**) support to the climate research community with access to operational models, forecast tools and datasets

Science priorities:

1. *CFS improvements*
2. *Multi-model ensembles*
3. *Climate forecast products*
4. *Reanalysis*

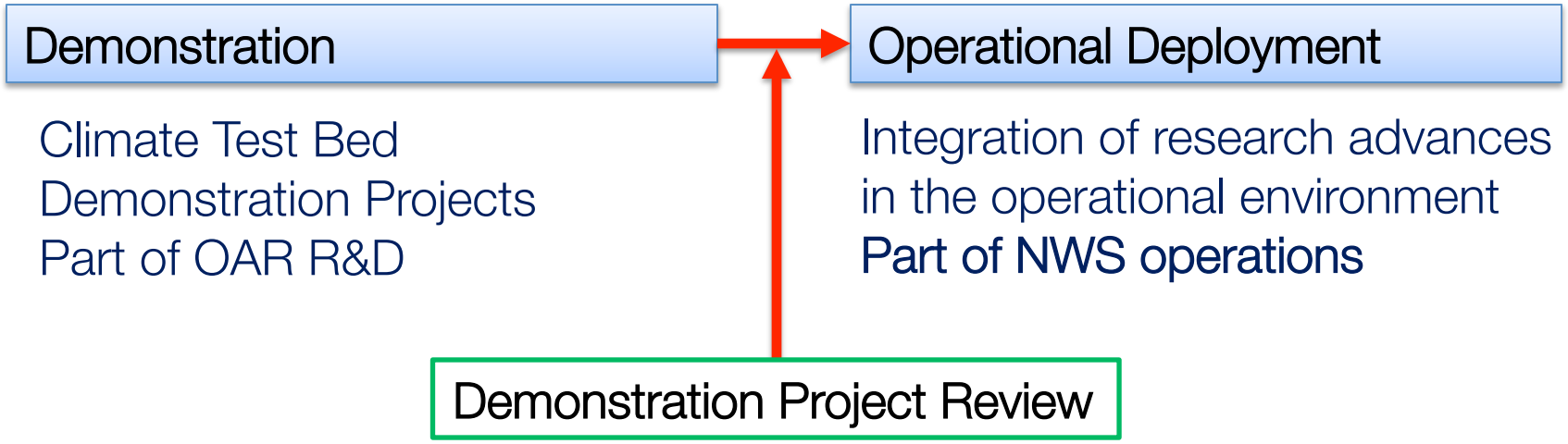
Near-term Priorities:

- *Improve NCEP Climate Forecast System (CFS)*
- *Test the NMME Sub-seasonal forecast system*
- *Improve forecast tools and products across week 2, 3, 4 to seasonal time scales including extremes*
- *Develop climate-quality Reanalysis for improved climate monitoring*

CTB Project Selection/Management - Overview

- CTB projects are funded by CPO/MAPP Program
- A MAPP–CTB Execution Agreement (2012) defining basic process and roles
- **Guiding document:** NOAA Administrative Order 216-105 Policy on Transition of Research and Development to Application

Two phases for transition of research into operations – a shared process



CTB Project Selection/Management - Details

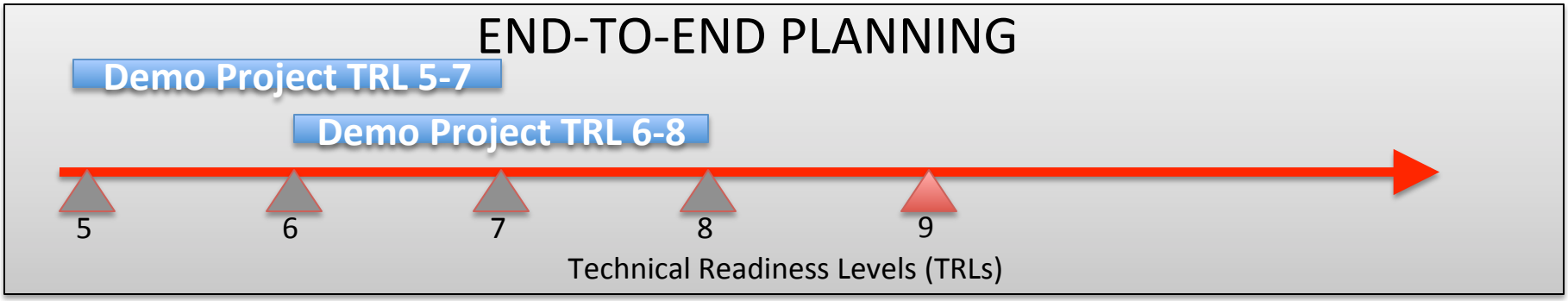
Demonstration Phase → **Operational Deployment Phase**

Competitively Select Meritorious Climate Test Bed Demonstration Projects

- Relevance to NCEP
- Involve an NCEP co-PI
- Clear testing objectives and operational outcomes
- High merit/right TRL
- Clear metrics
- Feasibility and support from NCEP

Operationally Deploy Successful New Methods and Models

- Plan for deployment, both systems and resources
- Adapt experimental new methods and models to comply with the operational suite (e.g., code requirements)



CTB FY14 Accomplishments: NMME

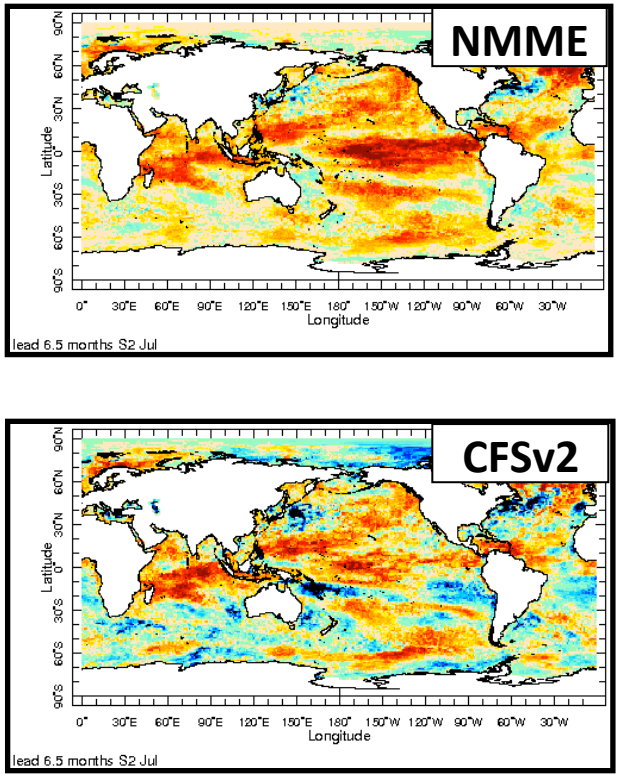
What was tested: North American Multi-model Ensemble (NMME) Seasonal prediction system based on major climate models in U.S. and Canada for NCEP operational seasonal forecasts

How it was tested: Tests based on 30-year hindcasts and real-time forecasts since August 2011

What was demonstrated: Improved forecast reliability, forecast skill (anomaly correlation, rank probability score)

Impact: (1) Improved numerical guidance for NCEP/CPC operational seasonal forecasts; (2) the most comprehensive seasonal prediction dataset available to the public for research and applications

Joint NCEP/CPO planning for transition to operations during F15: a dual service/research purpose



Comparison of NMME and CFSv2 skills based on 30-year hindcasts (July 1 start DJF SST forecast Ranked Probability Skill Score)

CTB FY14 Accomplishments: CFS Evaluation and Improvements

To accelerate evaluation of and improvements to the operational Climate Forecast System (CFS) and to enhance its use as a skillful tool in providing NCEP's climate predictions and applications

(1) Support R2O testing/demonstration grants projects

- Test and evaluate new parameterizations, schemes, model components in NCEP operational models
- 5 ongoing modeling projects

  Cloud-CPT 1 PI: Krueger, EMC Co-PI: Moorthi
  Cloud-CPT 2 PI: Bretherton, EMC Co-PIs: Jongil Han and Rui-Yu Sun
  Lake Module PI: Jin J, EMC Co-PIs: Ek and Wu
  Land Module PI: Chen, EMC Co-PIs: Ek, Yang and Meng
  Aerosol Module PI: Lu, EMC Co-PI: Hou YT Co-I Moorthi

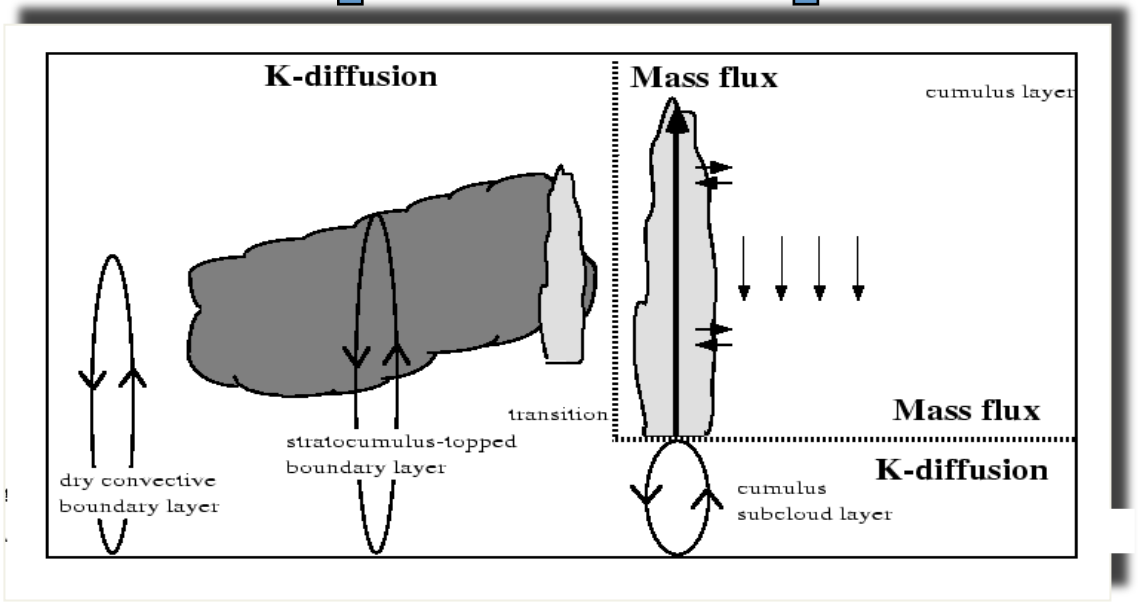
(2) Engage the external community

- Led the publication of the Special CFSv2 Collection in Climate Dynamics (23 articles)
- Leading MAPP Climate Model Development Task Force with a focus on NCEP/ CFSv3 development in 2014-2016

CTB FY14 Accomplishments: CPTs to improve NCEP Operational Models

- "Hybrid EDMF" (Eddy-Diffusivity Mass-Flux) scheme became operational in GFS, which improved representation of dry convective updrafts in strongly unstable boundary layers.
- The next step is to implement a candidate EDMF parameterization for GFS and CFSv3 that includes a full representation of moist processes.

$$\overline{w'\phi'} \cong -K\frac{\partial\bar{\phi}}{\partial z} \qquad \overline{w'\phi'} \cong M(\phi_u - \bar{\phi})$$



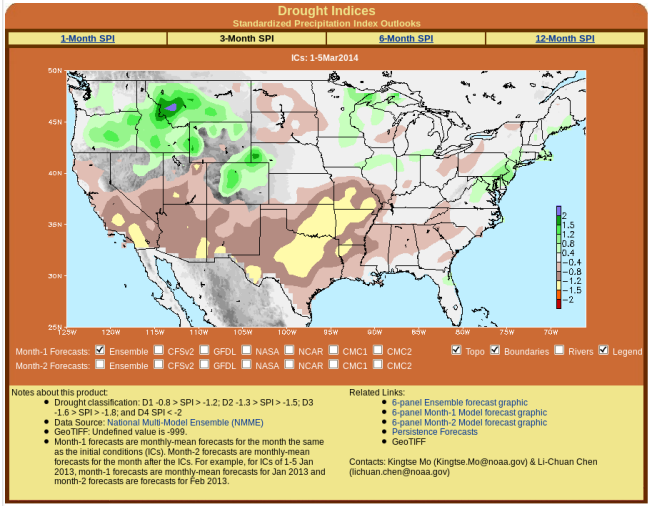
NCEP: J. Han, R. Sun
GFDL: C. Golaz, M. Zhao
JPL: J. Teixeira , M. Witek
UW: C. **Bretherton**, C. Jones, P.Blossey

CTB FY14 Accomplishments:

Improving NCEP Operational forecast tools/products

4 Projects on Prediction Systems and Product Development

1. **Week-3 and Week-4 Forecast Tools** PI: Xie/ Johnson, CPC Co-Pis: L'Heureux and Baxter
2. **Extended Range Severe Weather Forecast Tools** PI: Tippett, CPC Co-PI: Gottschalck, SPC Co-PI: Carbin
3. **NMME Prediction Post-processing Protocol** PI: Del Sole, CPC Co-PI: Kumar
4. **Probabilistic NMME Products** PI: Barnston, CPC Co-PIs: van Den Dool and Becke



NMME-based Seasonal Drought Outlook

Project Title	Current Estimated TRL	Expected TRL at the end of Demonstration Phase	Potential TRL after Demonstration
Cloud 1	6	8	9
Cloud 2	6	8	9
Land	6	8	9
Lake	5	8	9
Aerosol	5	8	9
NMME seasonal	8	8	9
Week-3/4 Tool	7	8	9
Severe Weather Outlook	5	8	9
NMME Probabilistic Tool	6	8	9
NMME Post-processing	6	8	9

CTB Top activities in progress/planned for FY15.

NMME

- Transition NMME Seasonal Forecast System into NCEP operation
- Plan for testing NMME Sub-seasonal forecast protocol

NCEP operational models

- Engage the external community for CFSv3 planning
- Support Climate Process Teams to contribute to the development of NGGPS and CFSv3

Develop forecast tools/products for Weeks 3-4

Develop transition plans for existing test projects.